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THE MOUNTAINS OF NEW ZEALAND. — In the coast scenery of New Zealand, with its deep fiords and mountains, none of which, however, rise above an elevation of nine or ten thousand feet, we find some interesting similarities to the scenic features of the Pacific coast of Oregon and Alaska. An interesting account of the physical geography of New Zealand, particularly the province of Otago, is given by Messrs. Hutton and Ulrich in their Report on the Geology and Gold Fields of Otago. The sounds or fiords were in one case found to be 1728 feet in depth. Mr. Hutton notices the points of difference between the Alps of Switzerland and those of New Zealand. "No one," he says, "after visiting the Alps of New Zealand, could fail to notice two remarkable points of difference between these mountain regions. The one is that mountains with sharp, serrated summits, which are the exception in Switzerland, are the rule in New Zealand, and the other is that the numerous large waterfalls which the traveler in Switzerland sees at almost every turn are quite exceptional in New Zealand. A few waterfalls, but they are very few in comparison with Switzerland, are found in the deep fiords on the west coast, and a few smaller ones towards the heads of the valleys in the heart of the mountains, and these are nearly all. And yet the mountains in New Zealand are quite as rough and rugged as the Alps of Europe, and indeed the gorges are more numerous and deeper. There are also other minor points of difference."

GEOGRAPHY AND EXPLORATION.

CAMERON'S EXPLORATIONS IN TROPICAL AFRICA. — Cameron's achievement stands quite alone. For the first time in the history of the world a European traveler has walked across tropical Africa from east to west. But Cameron has done more. This wonderful march of three thousand miles is but a portion of his work. He has taken such a series of scientific observations as will place him in the foremost rank of practical geographers; he has surveyed the southern half of the great Lake Tanganyika, has solved the problem of the course of the Congo, and has fixed the position of the water parting between the Congo and the Zambesi.

Born in 1844, and having entered the navy in August, 1857, Lieutenant Cameron was only twenty-eight when he received his instructions from Sir Bartle Frere at Zanzibar, and took command of the Livingstone East Coast Expedition. His previous services, which qualified him for this important charge, are recorded at page 274 of *Ocean Highways* for December, 1872. His instructions, dated February 14, 1873, were to take up supplies to Dr. Livingstone, and to carry out such exploration as he might direct or advise, it being specially pointed out that the completion of the survey of Lake Tanganyika was work of great importance. Accompanied by his friend and old messmate, Dr. Dillon,

R. N., and by Lieutenant Murphy, R. A., Cameron made a final start from the east coast for the interior on the 18th of March, 1873.

The young lieutenant showed his admirable fitness for the work from the first. There were special and peculiar obstacles which entailed very heavy expenditure, and Dr. Kirk was of opinion that no expedition, starting from Zanzibar, ever had so many difficulties to encounter. Cameron gallantly faced and overcame them, and, in spite of them all, he reached Unyanyembe on the 4th of August, 1873.

At this place all the members of the expedition suffered terribly from illness. Out of forty-five days Cameron himself was down with fever during twenty-nine, and was afterwards prostrated by a still more serious fever, of a remittent type, and inflammation of the eyes. It was here that the faithful servants of Livingstone, bringing with them the remains of the great traveler, and his journals and other effects, joined the relief expedition and received that aid which enabled them to reach the coast. Lieutenant Cameron sent down the Livingstone caravan to the coast, in charge of Lieutenant Murphy, with ample supplies for the journey; and the continued illness of Dr. Dillon obliged him also to return. The party left Unyanyembe on the 9th of November, 1873, and on the 17th, Cameron's friend, Dillon, "a skillful and zealous officer, and a highly accomplished scholar and firm and steadfast friend," succumbed to the effects of overwork and a pestiferous climate.

Cameron was now alone; but his work was not yet done. Livingstone's servants had reported that a most important map belonging to the doctor had been left at Ujiji, without which the record of the great traveler's discoveries would be very incomplete. It seemed to the young explorer that its recovery was a sacred duty, and he also considered himself bound to do his utmost, with the means at his disposal, to further the cause of geographical discovery. With these objects, but still suffering acutely from the effects of fever and ophthalmia, Cameron set out from Unyanyembe for the west on the 11th of November, 1873. He kept on steadily working "westward ho!" with dauntless perseverance, until he reached the shores of the Atlantic.

Traveling through a difficult and entirely new country, he discovered several of the southern tributaries of the Malagarazi and the interesting region they water, and on the 21st of February, 1874, he reached the shores of Lake Tanganyika.

Cameron's first great geographical exploit after reaching Ujiji was the survey of Lake Tanganyika, which he ascertained to be 2754 feet above the level of the sea. He launched his boats in March, 1874, closely examined and surveyed the whole southern half of the lake, discovered the great stream called Lukuga, flowing out of it, and returned to Ujiji on the 9th of May. His invaluable map of the lake will be found facing page 72 of the *Geographical Magazine* for March, 1875, and was also published in the Proceedings of the Royal Geographical Society. Cam-

eron has since been informed that Lukuga, the outlet of Lake Tanganyika, falls into the Lualaba above the junction of the Lurwa and the Kamorondo.

The gallant explorer started from Ujiji on his lonely and chivalrous expedition on the 20th of May, 1874, and, after traversing the Manyema country, arrived at Nyangwé on the Lualaba, the farthest point reached by Livingstone, in the following August. He found that Livingstone had placed this station ninety miles too far to the west. It proved to be only fourteen hundred feet above the level of the sea, which at once puts an end to any notion of the Lualaba being connected with the Nile system. Instead of flowing north, the Lualaba here turns to the west, and then west-southwest, eventually entering and flowing through a great lake called Sankowa. The river receives many tributaries from the south, and one very large stream from north of the equator, called the Lowa. Thus the drainage from both north and south of the equator accounts for the two rises in the Congo. For Cameron has now fully established the identity of the Lualaba and the Congo.

The advance from Nyangwé, Livingstone's farthest point, was the most momentous crisis in Cameron's undertaking. The difficulties were great. It was impossible to obtain canoes. The chief beyond the Lomané, which here falls into the Lualaba, declared his resolution of making war if the explorer attempted to cross his country. He was thus diverted from his intended route down the course of the Congo. But he was not to be stopped. The route he actually did take was of equal importance, and led to equally valuable geographical discoveries. It led south from Nyangwé, up the eastern side of the valley of the Lomané, to Kilemby, the capital of a great chief named Kasongo, who ruled over all the country of Urua.

The Urua country was first made known to us by Captain Burton, in his *Lake Regions of Central Equatorial Africa*, who calls it Uruwua, "a central district west of Tanganyika," with a ruler named Kiyombo, who was friendly to the Arabs, and traded in ivory, staves, and copper from Katanga. Dr. Livingstone also heard of the same country, which he called Rua; but Cameron was the first to discover it and fix its position.

Cameron remained at the capital of Urua from October, 1874, to February, 1875. It is a most important central point, for here the traders from the east and west meet. Cameron found an Arab merchant named Jumah ibn Salim, from Zanzibar, and also two mulatto traders named Alriz and Coimbra, from Bihé in Benguela. His long detention in Kasongo's country enabled the explorer to collect much valuable geographical information respecting the whole of this part of tropical Africa, including a complete and detailed account of the rivers and lakes which feed the Congo from the south. He discovered a new lake called Kasali, through which the Lualaba flows; and another, with no outlet,

called Mõhoya, which is specially interesting from having regular lake villages on its waters. He discovered also that the Lomané is a distinct river from the Kassabé, receiving a large stream called Luwembi from the west, coming from a lake called Iki, probably the Lake Lincoln of Livingstone. Katanga, the famous copper-yielding district, within the territory of Urua, is situated between the rivers Lualaba and Lufira, which unite, and the combined stream, after flowing through a chain of small lakes, receives the Lualaba of Livingstone, which is really the Lurwa. The united rivers then flow through Lake Lanji (the Ulengé of Livingstone), and past Nyangwé to Lake Sankowa, and thence, as the Congo, to the sea. Cameron ascertained the names and positions of all the different tributaries of these rivers, and will be able to give a complete account of the hydrography of this newly-discovered region of the Upper Congo.

After many vexatious delays, Cameron, accompanied by the mulatto Alriz, set out from Kasongo's country for Benguela. His course led him past the sources of the Lomané and the Luwembi, and close to the sources of the Lulua he came upon water flowing to the Zambesi. He traveled over a rich table-land, with numerous streams, to Sha-Kilembe's town, which he reached in September. The nights were cool on this elevated plateau, and on two occasions there was actually frost, when Cameron enjoyed the feeling of the crisp soil crunching under his feet. Sha-Kilembe is the Ya-Quilem of Ladislaus Magyar. It is on the river Lumèji, a tributary of the Liambeje, in latitude $11^{\circ} 31'$ south and longitude $20^{\circ} 24'$ east.

As the travel-worn party approached the goal, all nearly spent, and with supplies at the lowest ebb, their leader performed an additional journey of a hundred and twenty geographical miles, in order to bring assistance to his native followers. The route led from Sha-Kilembe to Bihé, and thence to the Portuguese town of Benguela, on the shores of the Atlantic, where Cameron arrived last October, and whence he proceeded to Loanda to recruit his health. Thanks to the forethought of the Viscount Duprat, the great traveler received every attention and much kindness from the Portuguese officials. As soon as he has found means of sending his other followers to Zanzibar, he will return home with old Bombay, the veteran servant of former travelers, and a small boy named Jacko, who accompanied him from Unyanyembe.

When Cameron arrives in this country, and fills in the details of the mere skeleton route which is now before us, we shall have a story of unsurpassed interest, whether we consider the great geographical discoveries he has made, the new regions he will describe, or the personal narrative of the intrepid sailor himself.

But Cameron's extraordinary merit rests mainly on the number and value of his scientific observations. The total distance over which he has marched from Zanzibar to Benguela is 2953 miles. Along this

route he has fixed 85 positions and taken 706 observations, consisting of 137 for latitude by stars north and south of the zenith, 196 for time, 368 lunar observations, one for the sun's eclipse of April 6, 1875, and four amplitudes for compass variation. His method of observing lunars for longitude is of the first order, namely, by stars east and west of the moon's enlightened limb; and by computing his observations, he has not only laid down his route accurately, but has also projected a remarkable section of the country over which he traveled, from the Indian Ocean to the Atlantic. The heights of places above the sea are determined by four Casella's aneroids, including 3718 observations, and by 70 observations of five boiling-point thermometers. The itinerary gives the approximate latitude and longitude of all the places visited, and their distances from each other; and by this itinerary, with the observations for height, the section sheets have been projected. Cameron also collected a vocabulary of the language of interior Africa, comprising fourteen hundred words.

The vast importance of Cameron's discoveries, which establish on a firm basis the geography of south tropical Africa, cannot be fully appreciated and understood without a carefully prepared map accompanied by a critical commentary, which will be published in our number for March. Meanwhile we may look for the return to this country of the great traveler himself, where he will receive a hearty and cordial welcome.

But Cameron himself has abstained from laying any claim to theoretical or hypothetical discoveries, and has merely stated facts that have come under his observation, and the reports he has collected from Arabs and natives. He has never claimed the discovery of the outlet to Lake Tanganyika. He has simply described a stream, called the Lukuga, which he found to be flowing out of the lake, and the course of which he followed for four miles. He leaves deductions to geographers at home, while he furnishes them with accurate data for forming their conclusions. It is Burton who has generously called his young successor "the second discoverer of Tanganyika." Cameron's observations are more complete than those of any previous traveler, but he speaks with characteristic modesty of his discoveries. "As for geographical work," he says, "I have cleared up a lot of mistiness, if not positive darkness; but the work is immense, and ought to be taken in hand thoroughly, and not by desultory expeditions which make their way to one point, and then have to come away with their work unfinished. Fresh men should take up the work of their predecessors, instead of, as at present, every man having to hunt for his own needle in his own bundle of hay." If all travelers worked and observed as Cameron has done, there would be little left to desire. — *Extracted from The Geographical Magazine for February.*